THURSDAY, JANUARY 3, 1918.

ELECTRICAL ENGINEERING.

(1) *A Treatise on the Elements of Electrical Engineering.* A Text-book for Colleges and Technical Schools. By William S. Franklin. Vol. i., *Direct- and Alternating-current Machines and Systems.* Pp. x+465. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1917.) Price 24*s.* net.

(2) *Continuous-current Motors and Control Apparatus.* A Practical Book for all Classes of Technical Reader. By W. Perren Maycock. Pp. xvi+331. (London: Whittaker and Co., 1917.) Price 6*s.* net.

(3) *Power Wiring Diagrams.* A Handbook of Connection Diagrams of Control and Protective Systems for Industrial Plants. By A. T. Dover. Pp. xv+208. (London: Whittaker and Co., 1917.) Price 6*s.* net.

(1) IT is usual for writers of books on electrical engineering to confine themselves to the theory either of direct-current or of alternating-current practice. In an elementary treatise, however, it is best to include both, and this the author has done. A most satisfactory feature is the introduction of the concepts of the modern theory of electrons, and this greatly stimulates the interest of the reader in many of the phenomena and apparatus described. Other excellent features are a free use of the calculus—we were impressed by the pains taken to make the mathematics simple—and the introduction of many easy problems.

After the table of contents, Prof. Franklin gives a list of the national organisations and societies in America relating to engineering, and describes the field in which each society is specially interested. The student is encouraged to obtain further information directly from the secretaries of these societies. In particular, he is advised to write to the Bureau of Standards at Washington to obtain a list of its publications and full information about its activities. This is very properly regarded as an essential part of the education of an American engineer.

In the first few chapters a *résumé* is given of magnetism and electrodynamics. In several places the author has abbreviated his explanations until they are obscure. We read, for example, on p. 73 that when a circuit has a certain inductance "one volt will cause the current in the circuit to increase at the rate of one ampere per second." The uninitiated reader would naturally think that the current goes on continually increasing so long as the volt is applied in the same way as the velocity of a mass of one gram goes on continually increasing when a dyne is applied to it.

The author is hampered by his loyal adherence to the nomenclature list published by the American Institute of Electrical Engineers. For instance, he calls the unit of the flux of magnetic induction the maxwell, and the unit of magnetic induction density the gauss. We deduce also that a gauss is both a gilbert per centimetre and a maxwell per square centimetre. It seems to us that there is a quite unnecessary dragging in of the names of great men of science, especially as the definitions are framed on the assumption that permeability is a simple numeric. Clerk Maxwell would not have admitted this assumption. The American gauss is the unit both of magnetic induction and of magnetic force. Many physicists consider that magnetic induction is caused by magnetic force just as strain is caused by stress. The assumption that cause and effect are measured in the same unit is unjustifiable.

In our opinion the practice of christening units after the names of men of science should be adopted only very sparingly. The watt and the joule are well named, but we deprecate the growing use of the kelvin for the unit in which electrical energy is bought and sold. Those evil-sounding words, also, the abohm, the abampere, and the abfarad, used by Americans are almost libellous to the great men whose memory they are supposed to keep green.

On p. 96 a table of sparking distances is given between spherical electrodes the diameters of which are 0·5, 1, 2, and 5 cm. respectively. The room temperature at which the experiments were made was 18° C., and the reading of the barometer 745 mm. Analysing the figures given, we find that for a given pair of electrodes the spark occurs very approximately when the maximum potential gradient between them attains a certain definite value. Surely the author should have pointed this out. It is a physical fact of great interest and may well prove to be the starting point of new advances in our knowledge. It is at least of practical value to be able to calculate the sparking distances between spheres and the voltages at which the brush discharges begin to appear on them.

The chapter on the electron theory is clearly written, and much knowledge is given in little compass. We are sorry that Peek's formula for the voltage at which the corona appears on cylindrical wires is not given, as it is wonderfully accurate and most useful to power engineers. Descriptions are given of Cottrell's apparatus for precipitating dust and smoke particles from the atmosphere, and of ozonisers for converting oxygen into ozone. But the most interesting devices described are the vacuum-tube current valves the action of which depends on the emission of electrons by hot bodies. These current valves are now much used as receivers and detectors in radiotelegraphy, and also as "amplifiers" either for exciting or for maintaining electric oscillations.

In those parts of the book devoted more particularly to engineering the author describes the latest types of electrical machines, and it is satisfactory to notice how well they illustrate fundamental principles, and how amenable their theory is to elementary mathematical treatment. The series parallel controller, the rotary converter, the frequency transformer, and all the various types

© 1918 Nature Publishing Group

of polyphase motor are cases in point. Some of the proofs given are worthy of high commendation and will be much appreciated by students.

(2) A simple description is given of the various kinds of direct-current motors which are in everyday use, and the elementary theory of their action is explained. The problems which interest the designer are barely mentioned, but the practical methods of testing and the requisite calculations are fully described. The wiring connections are given in far greater detail than in ordinary treatises, and this will be of value to working engineers, enabling them to get a thorough grasp of the requisite connections for the electrical devices which they have to use constantly. Many numerical examples are given. We can recommend this book to the beginner and to all who wish to understand the working of electric starters, controllers, contactors, automatic lifts, etc. The book is well printed, the diagrams are clear, and the machinery and devices described are of the latest types.

(3) The author clearly indicates the scope of his book by describing it as a handbook of connection diagrams of control and protective systems for industrial plants. Considering the limited space at his disposal and the very complicated direct- and alternating-current systems that have to be described, the author has, on the whole, been successful. The reviewer would have liked fuller explanations in places, and some of the diagrams fatigue the eyes. As a book for occasional reference it will prove useful. We notice that in accordance with the practice of many engineers a zigzag line is used to denote an inductive coil. A helical line, however, is more self-explanatory and practically as easy to draw, and we have good hopes that it will soon be universally used. Recommendations to this effect have frequently been made by " symbols " committees in many countries.

A. RUSSELL.

GEODETIC BASE MEASUREMENTS.

La Mesure Rapide des Bases Géodésiques. Par J.-René Benoit et Ch.-Ed. Guillaume. Cinquième édition. Pp. 285. (Paris: Gauthier-Villars et Cie, 1917.)

THE use of invar wires in the measurement of bases in geodetic triangulation, as well as in topographical surveys, has become so well established that a new edition of MM. Benoit and Guillaume's handbook on their employment will be welcomed.

The fifth edition does not for the most part differ greatly from the previous edition, which appeared in 1908, but an additional chapter has been added, in which the results of later experience have been added. The control of the wires, both by fixed marks laid down in a building with which the length of each wire may be compared, and by a short base on which the wires can be used under field conditions, is discussed. The former is in use in England, France, Egypt, India, and elsewhere, while at Potsdam a 240-metre base is used. The permanence of mural control-marks is considered, and the experience of the Bureau at Bréteuil shows that the distance between such points of reference should be verified over a considerable period of time.

The results of base measurements at the Simplon tunnel in 1906, in Uganda in 1907, in Portuguese East Africa, the Argentine, Russia, Mexico, and Rumania are given in some detail, as being operations for which the wires were verified at the Bureau; but these by no means exhaust the list of countries in which the method of measurement by means of wires, initiated by Prof. Jäderin, of Stockholm, in 1890, has been employed. In 1913 a base eight and a half kilometres long was measured near Lyon by the Geographical Service of the Army both with invar wires and with an invar 4-m. bar, in which the mean values obtained by to-and-fro measurements with the bar and those of two wires differed only by 8·3 mm.

The need for comparison between the " bases murales " or the control-marks which now exist in several countries is insisted on, and such a comparison between Bréteuil and Teddington had been taken in hand recently, but has been interrupted by the war. The results of investigations, which were undertaken on the proposal of Sir David Gill, to ascertain the changes caused in a wire by constant use at normal tension are set out; and the results of the comparison made with twelve wires from four to six times yearly over the period 1908 to 1916 in continuation of an earlier series, 1904 to 1907, show well the stability of these wires when carefully handled under favourable conditions.

Three notes on the expansion of invar and the effect of mechanical and thermal treatment upon it conclude this very useful handbook on the use of these wires in field measurement, and the precision which may be attained with them.

More can be said regarding the practical use of these wires in the field and the various difficulties that have from time to time been encountered; but as these lie outside the personal experience of the authors they have not been specially dealt with in this volume.

H. G. L.

PHILOSOPHY.

A Defence of Idealism: Some Questions and Conclusions. By May Sinclair. Pp. xxi + 396. (London: Macmillan and Co., Ltd., 1917.) Price 12*s*. net.

MISS MAY SINCLAIR'S "Defence of Idealism" is written with a most refreshing ease and freedom from technicality. It is the work of an amateur, but of an amateur who has read much and sees how arguments that are usually thought to be abstruse bear closely upon problems which should command the interest of every thinking person. Professional students cannot fail to regard such a book as a gratifying proof of the vitality of philosophy in this country.

The idealism which Miss Sinclair sets out to defend is not idealism in general, but idealistic monism. It would have been well if Miss Sinclair

© 1918 Nature Publishing Group